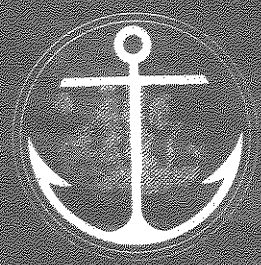


Executive Summary
208 AREA WIDE
WATER QUALITY
MANAGEMENT PLAN
ANCHORAGE, ALASKA



AUGUST 1979



MUNICIPALITY OF
ANCHORAGE
GEORGE M. SULLIVAN
MAYOR

208 WATER QUALITY MANAGEMENT PLAN

ANCHORAGE, ALASKA

EXECUTIVE SUMMARY

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Municipality of Anchorage
George M. Sullivan, Mayor

ANCHORAGE 208 WATER QUALITY MANAGEMENT PLAN

EXECUTIVE SUMMARY

Introduction

The 208 Areawide Water Quality Management Plan examines existing water quality problems in the Anchorage area caused by non-point source pollution. Non-point source pollution in an urban area consists of street runoff, erosion from construction sites, runoff from snow disposal sites and similar types of wastewater that do not originate from a single source. The plan develops and evaluates three levels of control designed to 1) improve water quality in Ship, Chester, Campbell and Fish Creeks, and 2) maintain adequate water quality in the creeks to protect all existing water uses over the next 20 years even as population growth and urbanization tend to further degrade the water.

What is 208 Planning?

The plan is a result of Section 208 of Public Law 92-500, the Water Pollution Control Act Amendments of 1972. Under Section 208, state governors can designate special areas where there is a concern for existing and future water quality. These areas are then eligible to receive grants under Section 208 to carry out a 2-year planning program to develop specific management plans for maintaining and improving water quality. Anchorage was designated by Governor Hammond as a 208 planning area because of the impacts of urbanization on water quality in the area. In addition to designating the area, the Governor must designate an agency to carry out the planning. The Municipality of Anchorage was so designated by the Governor and undertook the management of the 208 program within the urban area. The Municipality, as the designated 208 Areawide Planning Agency, received direct program funding from the Environmental Protection Agency. The U.S. Army Corps of Engineers and various consulting firms were employed by the Municipality to help produce the information needed to develop a plan.

Water Quality Goals

The Pollution Control Act sets July 1, 1983 as the date for achieving a national interim water quality goal of providing for the protection and propagation of fish, shellfish and wildlife and providing for recreation in and on the nation's waters. This interim goal, commonly referred to as the fishable/swimmable goal, is the primary objective of the Municipality's 208 program.

The State of Alaska water quality standards reinforce the goal set by the Pollution Control Act by specifying criteria or pollutant levels for each water use. All of the creeks in the Anchorage area are classified for all uses, including water supply for drinking, water recreation, and growth and propagation of fish and wildlife.

A water quality management plan was drafted to achieve the fishable/swimable goal. In order to achieve it, the plan had to contain certain elements which were controversial in one way or another. Some elements were considered by certain people and agencies to have excessively high costs. Others were questioned from the standpoint of technical, legal, or administrative feasibility. Still others were judged by some to have significant negative environmental and socio-economic impacts. Therefore, a second, less ambitious water quality goal was designed based on the continuation of existing practices only.

In contrast, certain people and agencies felt that neither of the two water quality goals adequately protected the existing and possible future water uses in the area. Therefore, an ambitious water quality goal was designed to protect more uses in more streams within the study area. One of these uses was drinking water supplies in the surface waters within the urban area.

These three alternative water quality goals were assumed to provide a reasonable choice among different water quality approaches. Water quality management plans were developed to achieve each of the three alternative water quality goals. Of course, a whole spectrum of water quality goals, ranging from the least ambitious based on existing practices to the most ambitious described above, could be generated by mixing elements of the three alternative goals and associated management plans. Therefore, in reality, this report offers many more than three alternatives.

The Scope of the Anchorage 208 Plan

The purpose of a 208 plan is to develop a coordinated set of management controls of pollutant sources on an areawide basis in order to prevent neglect of some types of sources. Without this coordinated approach, over control of some sources and lack of control of others could result in needless expense and still not achieve desired water quality goals.

In the Anchorage area, a major portion of this overall planning was already underway before the 208 plan was started. The MAUS program (Metropolitan Anchorage Urban Study) being conducted by the U.S. Army Corps of Engineers

included study of wastewater treatment facility or point source needs in Anchorage. The 208 plan did not duplicate this effort. The two plans together yielded the coordinated approach to water quality planning necessary to provide cost-effective solutions to the area's water quality problems.

Existing and Future Water Quality Problems

Water Quality Requirements

Water quality requirements are a central element of any wastewater management program. They form the foundation of any successful plan by providing a method of translating narrative goals and objectives into specific physical/chemical parameters which can be measured. Water quality requirements also provide criteria for monitoring the plan's performance and determining success or failure.

Both the Federal Government and the State of Alaska set the water quality requirements through a three step process. The process consists of 1) defining beneficial water uses and narrative goals and objectives, 2) determining specific physico-chemical water quality criteria which will achieve uses and goals, 3) classifying each surface stream or lake as to the desired beneficial use, which, in turn, specifies the numerical criteria to be applied to each water. The criteria, when used in combination with the uses, constitute the water quality standard for a particular water body. Table 1 summarizes some of the water classes and criteria important for Anchorage area streams and lakes. All Anchorage area waters are now classified for all uses. Under the Alaska Standards, the most restrictive classification, drinking water supply, is the controlling use.

The Alaska Water Quality Standards are revised once every three years. The latest revision occurred in early 1979. This revision requirement allows the standards to accommodate changing goals and objectives and changing knowledge of stream conditions and uses.

Water Quality Data and Problem Areas

Water Quality Data

An important task for the 208 plan was to evaluate existing and future water quality in the principal surface waters of the study area -- Ship, Chester, Campbell and Fish Creeks, and Lakes Hood and Spenard.

Water quality in the surface waters in the Anchorage area is generally good compared to that in other urban areas.

TABLE 1

SELECTED WATER QUALITY CRITERIA

Water Quality Parameters	(1) Fecal Coliform Bacteria (FC) (See note 1)	(2) Dissolved Gas	(3) Turbidity (not applicable for groundwater)
I. Fresh Water Uses			
(A) Water Supply: (i) drinking, culinary and food processing	Based on a minimum of 5 samples taken in a period of 30 days, mean shall not exceed 20 FC/100 ml, and not more than 10% of the samples shall exceed 40 FC/100 ml. For groundwater the FC concentration shall be less than 1 FC/100 ml when using the fecal coliform Membrane Filter Technique or less than 3 FC/100 ml. when using the fecal coliform MPN technique.	Dissolved oxygen (D.O.) shall be greater than or equal to 4 mg/l (this does not apply to lakes or reservoirs in which supplies are taken from below the thermocline or to ground waters).	Shall not exceed 5 NTU above natural conditions when the natural turbidity is 50 NTU or less, and not have more than 10% increase in turbidity when the natural condition is more than 50 NTU, not to exceed a maximum increase of 25 NTU.
(B) Water Recreation: (i) Contact recreation	Based on a minimum of 5 samples taken in a 30 day period, the mean shall not exceed 20 FC/100 ml., and not more than 10% of the total samples shall exceed 40 FC/100 ml.	D.O. shall be greater than or equal to 4 mg/l.	Shall not exceed 5 NTU above natural conditions when the natural turbidity is 50 NTU or less, and not have more than 10% increase in turbidity when the natural condition is more than 50 NTU, not to exceed a maximum increase of 15 NTU. Shall not exceed 5 NTU over natural conditions for all lake waters.
(B) Water Recreation: (ii) secondary recreation	Based on a minimum of 5 samples taken in a 30 day period, the mean shall not exceed 200 FC/100 ml, and not more than 10% of the total samples shall exceed 400 FC/100 ml.	D.O. shall be greater than or equal to 4 mg/l.	Shall not exceed 10 NTU over natural conditions when natural turbidity is 50 NTU or less, and not have more than 20% increase in turbidity when the natural condition is more than 50 NTU, not to exceed a maximum increase of 50 NTU. For all lake waters turbidity shall not exceed 5 NTU over natural conditions.
(C) Growth and Propagation of Fish, Shellfish other Aquatic Life, And Wildlife Including Waterfowl and Furbearers	Not applicable.	D.O. shall be greater than 7 mg/l in waters used by anadromous and resident fish. In no case shall D.O. be less than 5 mg/l to a depth of 20 cm in the interstitial waters of gravel utilized by anadromous or resident fish for spawning. For waters not used by anadromous or resident fish, D.O. shall be greater than or equal to 5 mg/l. In no case shall D.O. above 17 mg/l be permitted. The concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.	Shall not exceed 25 NTU above natural condition level. For all lake waters, shall not exceed 5 NTU over natural conditions.

TABLE 1 (cont.)

SELECTED WATER QUALITY CRITERIA

Water Quality Parameters	(4) Sediment (Not Applicable to Groundwater Supplies)	(5) Toxic and Other Deleterious Organic and Inorganic Substances
I. Fresh Water Uses		
(A) Water Supply: (i) drinking, culinary and food processing	No measurable increase in concentrations of sediment above natural conditions.	Substances shall not exceed <u>Alaska Drinking Water Standards</u> or <u>EPA Quality Criteria for Water</u> as applicable to substance.
(B) Water Recreation: (i) Contact recreation	No increase in concentrations above natural conditions.	Same as (1)(A)(i)
(B) Water Recreation: (ii) secondary recreation	Shall not pose hazards to incidental human contact or cause interference with use.	Substances shall not be present which pose hazards to incidental human contact.
(C) Growth and Propagation of Fish, Shellfish other Aquatic Life, And Wildlife Including Waterfowl and Furbearers	The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters utilized by anadromous or resident fish for spawning may not be increased more than 5% by weight over natural condition (as shown from grain size accumulation graph). In no case may the 0.1 mm to 4.0 mm fine sediment range in the gravel bed of waters utilized by anadromous or resident fish for spawning exceed a maximum of 30% by weight (as shown from grain size accumulation graph). In all other surface waters no sediment loads (suspended or deposited) which can cause adverse effects on aquatic animal or plant life, their reproduction or habitat.	Substances shall not individually or in combination exceed 0.01 times the lowest measured 96 hour LC50 for life stages of species identified by the department as being the most sensitive, biologically important to the location, or exceed criteria cited in <u>EPA, Quality Criteria for Water</u> or <u>Alaska Drinking Water Standards</u> whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests

Surface waters appear able to sustain fish and wildlife, do not pose major health hazards, and are suitable for most recreational purposes. However, violations of State Water Quality Standards occur in many of the creeks, and violations are expected to become more numerous in rapidly urbanizing basins like Campbell Creek. One purpose of the 208 plan is to correct these violations of standards and to prevent worse violations from occurring in the future, since it is generally more economical to prevent water quality problems than to upgrade streams with poor quality.

Water quality data for the study area were obtained from five sources. Data were available for the period 1948 through 1978, but the majority of samples were from the 1974 through 1978 period. Sampling locations are given in Figure 1. Although the figure shows a widespread sampling effort, the frequency of sampling at many of the stations has been too low to tell with much certainty where, how much and how often water quality standards violations occur.

To overcome this problem of scarce data, the consultants to both the Municipality of Anchorage and the Corps of Engineers relied on computer modeling to simulate existing and future water quality in two of the four principal creek basins, Campbell Creek and Chester Creek. The models gave a better understanding of the temporal and spatial changes in pollutant loadings and concentrations. They also allowed estimation of the future impacts of increased urbanization on water quality. An example of the results of this modeling is Figure 2, wherein maximum fecal coliform bacteria levels are shown as a function of river mile. Bacteria levels were computed for 1978 and 1995 for snowmelt and rainfall events having conditions similar to those occurring on the dates shown on each graph. Figure 2 represents projected conditions if controls are not implemented.

Water Quality Problem Areas

Water quality can be evaluated and water quality problems defined in a number of ways. Some people consider any degradation of water quality to be a problem. Others consider a violation of the State Water Quality Standards to be a water quality problem. And others do not consider a water quality problem to exist unless water pollution causes a fishkill, a beach closing, or some other serious loss.

In this study, the evaluation of water quality was accomplished by comparing the water quality defined by available water quality data and by computer simulations with the water quality criteria (Table 1). Whenever an actual or simulated pollutant concentration violated the water quality criterion, a water quality problem was said to occur.

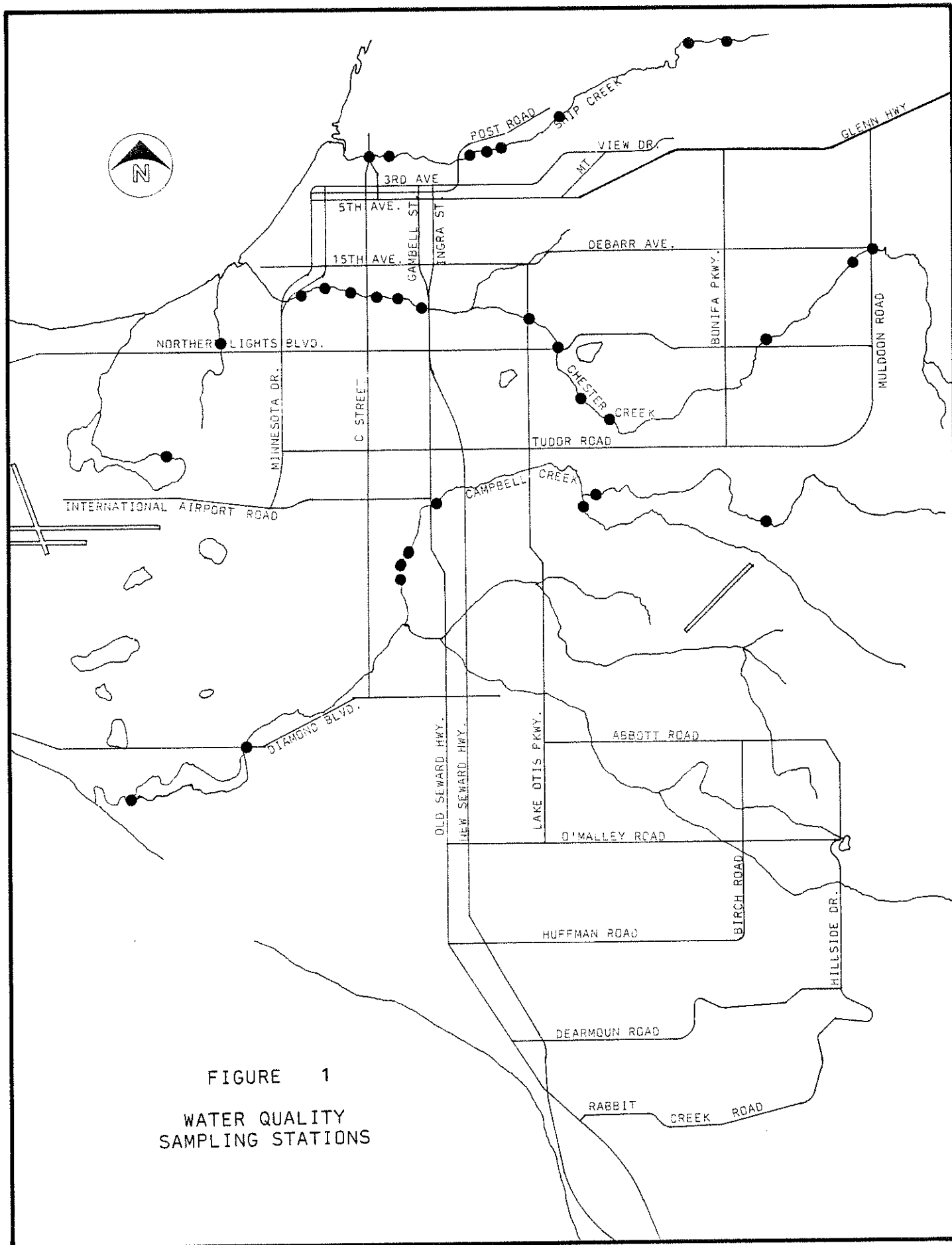


FIGURE 1
 WATER QUALITY
 SAMPLING STATIONS

LEGEND



--- CRITERION (PROPOSED STANDARD)

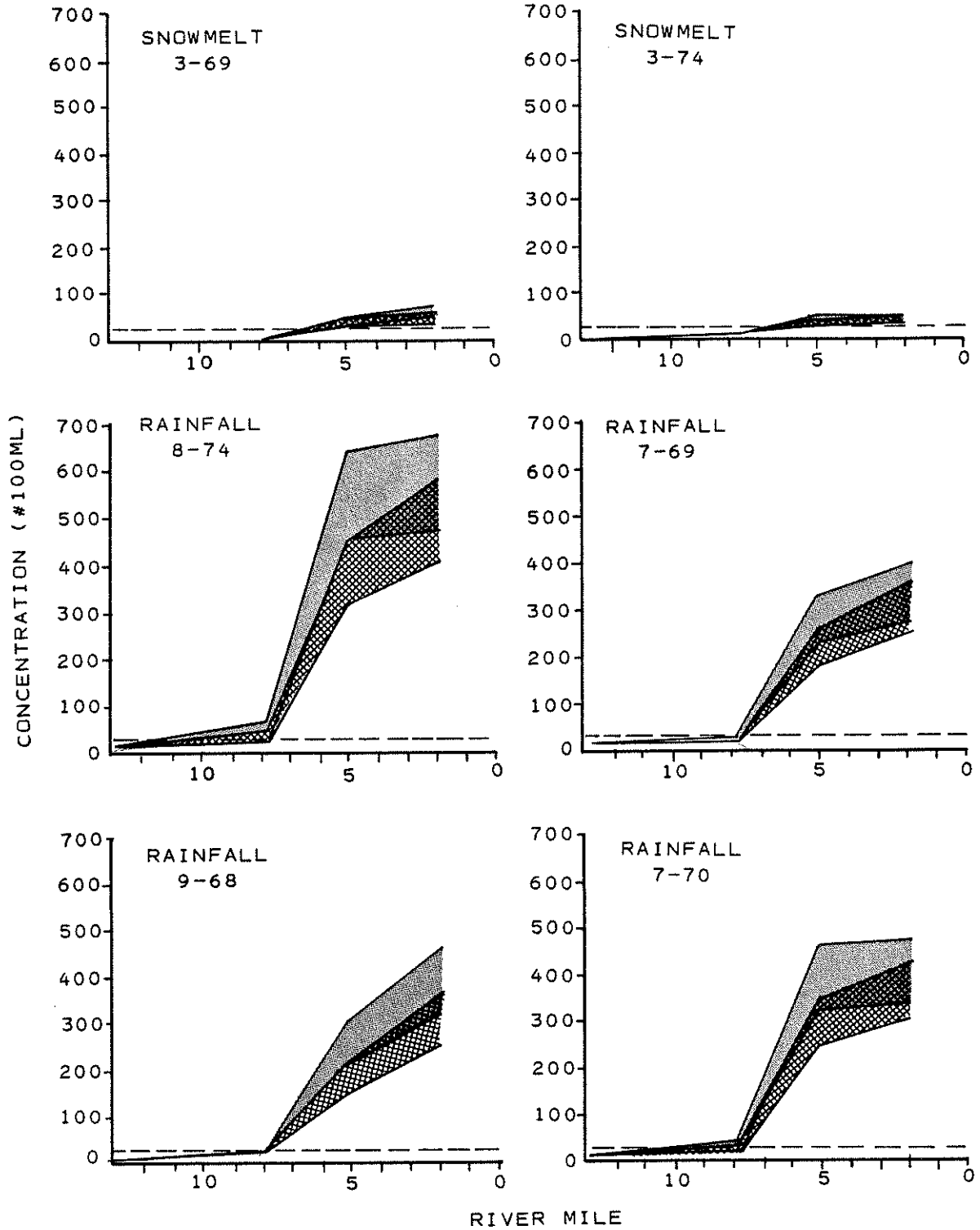


FIGURE 2
MAXIMUM FECAL COLIFORM CONCENTRATIONS
CAMPBELL CREEK



Violations of the criteria were tabulated for all available surface water quality data. Where computer modeling predicted future violations of the criteria, these also were tabulated. A summary of the water quality criteria violations or problem areas is given in Table 2. The table lists the water quality classification and parameters which exceed the criteria set for each class. The majority of pollutant sources causing these violations of criteria are man-made. The 208 Plan discusses in more detail the violations, including suspected existing and future pollutant sources.

Without the implementation of controls, water quality problem areas will increase, leading to loss of beneficial uses or a demand for more expensive remedial measures.

The 208 plan makes the following conclusions about the water quality analysis in each basin:

In the Campbell Creek drainage basin, the water quality problems are solely caused by non-point sources. Consequently, the most significant water quality violations occur during runoff events. The most significant wet weather loadings of fecal coliform, suspended solids, ammonia, and oil and grease come from commercial and industrial lands in subbasins C and D (see Figure 5-2 of the plan for locations) and from Lake Otis Parkway, Seward Highway Old Seward Highway, C Street and Dimond Boulevard. During dry weather, the major fecal coliform and ammonia loadings are probably from 1,500 on-site treatment systems, most of which are located in Little Campbell Creek basin.

Fecal coliform
Ammonia

Similarly, in the Chester Creek basin, water quality problems are solely caused by non-point sources. Consequently, most water quality violations occur during runoff events. Fecal coliform, iron and dissolved solids violations occur during dry weather as well. Future controls should be directed toward pollutant control on roads and other paved surfaces, at snow disposal sites, and in any remaining septic tank areas.

Fecal coliform
Iron
Dissolved solids

For Ship Creek and Fish Creek, water quality problems and solutions parallel those on Chester Creek.

A more complete summary of the water quality analysis is contained in the 208 Plan.

Table 2
Water Quality Problems

Basin	Water Quality Problems			
	<u>Drinking Water</u>	<u>Contact Recreation</u>	<u>Secondary Recreation</u>	<u>Aquatic Life</u>
Campbell Creek	Fecal Coliform Iron Manganese (1) Turbidity	Fecal Coliform Manganese	Fecal Coliform	Aluminum Ammonia (2) Fecal Coliform Iron Manganese Oil and Grease (?) (3) Suspended Solids (3)
Chester Creek		Fecal Coliform Lead	Fecal Coliform	Fecal Coliform Iron Lead Suspended Solids (3) Dissolved Solids
Ship Creek		Fecal Coliform	Fecal Coliform	Fecal Coliform Iron Dissolved Solids
Fish Creek		Fecal Coliform	Fecal Coliform	Fecal Coliform Iron Dissolved Oxygen (3) Suspended Solids (3)

(1) Also includes sediment.

(2) A potential, but not an existing, problem.

(3) Also includes sediment and turbidity.

Alternative Control Plans

The 208 plan developed three alternative levels of non-point source pollution controls designed to halt further degradation of Anchorage's creeks and to improve future stream quality to meet water quality standards and criteria. The three control levels were designed to match the three levels of water quality goals discussed earlier, a very high level of quality, an intermediate quality level of fishable/swimable waters, and a lower, less expensive quality level reflecting the continuation of existing control efforts.

Level 1 is the existing program of control. The Comprehensive Plan, the Zoning Ordinances, the subdivision regulations, and reviews of permit applications by the Municipal Public Works Department have the effect of reducing pollution from non-point sources. The current program, while not specifically oriented to protecting water quality, is not a "do nothing" alternative. But the study of present and projected water quality, performed as part of the 208 Water Quality Management Program shows that all the water uses are impaired or will be impaired in the future without additional corrective actions. Level 1 controls will not meet the legal requirements established by the State of Alaska Water Quality Standards, and will not protect existing water uses.

Level 2 is a set of control measures, based on existing Municipal practices designed to reduce the four problem areas identified in the plan; non-point pollution from urban runoff, erosion from construction sites, runoff and percolation from snow disposal sites, and failure of on-site wastewater disposal systems. Level 2 controls orient present control practices more directly toward water quality protection, adding certain new elements such as storm water detention. Level 2 will result in water quality levels sufficient for all existing uses, but it will not satisfy all the requirements of the State Water Quality Standards. To satisfy these legal requirements, the Municipality would have to petition the State of Alaska to reclassify all the area creeks (except upper Ship Creek), deleting the classifications for drinking water supply and contact recreation. The Municipality and its consultant believe there is no substantial drinking water supply or contact recreation use of the creeks, either present or planned. The remaining use classes would include water supply (other than for drinking), secondary recreation (boating etc.), and the growth and propagation of fish and wildlife.

The Level 3 control strategy is to run interceptor storm sewers parallel to the creeks, diverting all runoff water into Cook Inlet, thereby greatly reducing the pollutant load. Level 3 would also incorporate some Level 2 controls such as limiting stockpiles of petroleum supplies near

creeks and lakes and prohibiting the direct discharge of wastewater. The Level 3 program would probably not improve water quality in the creeks sufficiently to allow use for drinking water supply. But the improvement in water quality would be the greatest of all the alternatives. The cost of implementing Level 3 would also be the highest of the three control levels. Finally, the environmental impacts of constructing the interceptors, often in the creekbeds, would be significant, and greater than the impacts for the other alternatives.

After setting the overall goals of each control level, the 208 Plan outlined a group of specific control tasks in the following 11 areas:

- Storm water detention
- Stream corridor protection
- Streetsweeping
- Control of untreated wastewater discharges
- Paved roads and parking lots
- Land use controls
- Discharge/diversion of storm runoff
- Water quality monitoring
- Construction site erosion and runoff
- Waste snow disposal
- On-site wastewater disposal systems.

Table 6-1 of the 208 Plan lists the mix of specific control tasks for each level of control. It is this mixture of tasks which determines what makes up the control level.

Evaluation of Alternatives

The three levels of control were evaluated using a variety of criteria including degree of water quality improvement, reliability, cost, environmental impact, implementability and public acceptability. The full details of the evaluation are given in Chapter 7 of the plan, but the conclusion from the analysis was fairly straightforward: Level 2 was the best solution. Level 1 could not be recommended because it would not achieve the water quality standards set by the Federal and State governments, nor would it protect current beneficial water uses. Level 3 was not satisfactory because it would involve spending money for unwanted and unneeded water uses, would have extensive adverse environmental impacts, and might, even so, fail to achieve the desired water quality.

The objective of all the alternative control levels is to enhance water quality, but in doing so, the control programs might result in some possibly negative environmental impacts. Most of the recommended control measures, such as

street sweeping and road and parking lot paving, are extensions of existing programs. Their environmental impacts would differ only in degree from those already being experienced and absorbed by the Anchorage area population.

Storm water detention ponds would be used to some extent under each alternative level. Adverse visual impacts and potentially high levels of noise and dust would be associated with construction of the ponds. Proper design could improve the visual impacts after revegetation. Multiple use of the pond areas as playing fields during dry periods would reduce the impact of long term land commitments. Not maintaining the ponds could reduce their effectiveness, create unsightly sediment build up and pose a danger to neighborhood children.

Level 2 relies most heavily on storm detention ponds; therefore, it would result in the greatest impacts from their use.

The environmental impacts of the recommended land use controls are generally beneficial. The existing stream corridor protection program provides water quality, wildlife habitat and recreational benefits. The 208 Plan recommends continuation of this program. Extension of the "bonus point plan" to areas outside the Central Business District, suggested under Level 2, should result in more innovative and aesthetically pleasing development in suburban areas.

The storm sewer interceptor system proposed under Level 3 would have the greatest environmental impact of the three alternative control levels. Installation of the pipeline would create major construction impacts, such as, interference with traffic flow, noise and dust, disturbance of natural vegetation, and an increase in water turbidity from temporary instream work. To some extent these impacts could be mitigated by using proper construction methods, but they could not be eliminated. Reducing the quantity of storm water discharged to the creeks could significantly alter stream hydrology. The full impact of this alteration is not known.

The 208 Plan recommends that the Municipality petition the State of Alaska to reclassify portions of Ship, Chester, Campbell and Fish Creeks, to delete the drinking water supply and contact recreation uses on these creeks. This action would make the water quality standards for the creeks consistent with the current and anticipated water uses and consistent with the goals of the Level 2 control strategy.

The Recommended Control Strategy

Through the 208 Planning Process, a control strategy (termed Level 2) has been developed to maintain current water quality and uses. The recommended strategy, summarized here, is divided into four subplans, one for each of the following four types of pollution considered to be a threat to water quality in the Anchorage area:

- Urban Runoff
- Erosion primarily from construction sites
- Runoff and percolation from snow disposal sites
- Failures of on-site wastewater disposal systems.

Urban Runoff

1. Existing design criteria for storm water controls should be amended to include more emphasis on storm water detention and water quality protection.
2. Stormwater controls may include sedimentation-type detention ponds, infiltration ponds, drywells, and multi-use areas among others.
3. The objective of the storm water controls would be to assure that storm water was detained either onsite, along the line, or at the outfall, for a time sufficient to remove about 60% of the sediment load.
4. The present stream corridor protection program should be continued with the following additions:
 - Restrict the stockpiling or storage of petroleum and other hazardous products within 100 feet of any water course to avoid the deleterious impact of spills.
 - All inwater construction work should be discouraged. That which is unavoidable should be conducted between June 1 and July 15 to avoid conflict with spawning salmon. Disturbed stream banks should be returned to a slope no greater than two horizontal to one vertical with replacement of natural vegetation.
 - Any planned road crossing in the vicinity of salmon spawning areas should be accomplished by bridge wherever possible.
 - Any water appropriation project should include 3/16-inch mesh screens on suction pumps to prevent entry of young salmon. In no cases should barriers that impair salmon migration be placed across the stream.
 - Flood Plain Regulations should be amended so the acquisition of a special flood hazard permit would not

be approved for any activities causing water quality degradation or other environmental hazards.

- ° Additions to the Little Campbell Creek linear park system should be implemented. The minimum width of the park should be 50 feet on either side of the creek.
- 5. To improve the effectiveness of the existing street sweeping program, there should be better enforcement of parking regulations. Litter ordinances should be enforced to prevent the raking of yard debris into the gutters.
- 6. Amend the Wastewater Disposal Regulations Section 15.65.020 to prohibit the discharge of point sources such as washdown of trucks, facilities and other machinery to the creeks.
- 7. The Municipality should strongly encourage the paving and maintenance of all parking lots in urban and suburban areas. Potholes should be repaired on a yearly basis and surfaces sealed as required to prevent the escape of sediments.
- 8. The Municipality should strongly encourage paving of all dirt roads in urban and suburban areas through use of street improvement districts.
- 9. Peat bog areas, to be identified in the ongoing Coastal Zone Management Plan, should be given priority consideration in future Municipal open space acquisition plans.
- 10. Developers should be encouraged to drain peat bogs in a manner which is least injurious to area creeks. Drainage plans should be reviewed on a case by case basis.
- 11. The "bonus point" system in the zoning ordinance should be expanded to developments outside of the central business district and be used as an implementation tool for the environmental design called for in existing Subdivision Regulations.
- 12. Since swales and ditches promote infiltration and, when compared to storm sewers, reduce peak runoff, continuation of this practice is strongly recommended where practical. Areas serviced by swales and ditches without severe drainage problems should not be provided with storm sewers and new developments should utilize swales and ditches to the extent possible through provisions

provided by Subdivision Regulations and Design Criteria and Improvement Standards. Major revisions of these regulations will not be required, they only have to be interpreted with an emphasis toward water quality.

13. The present water quality monitoring program should be expanded to include the deep aquifer production wells, six shallow ground water wells and some additional creek sites to monitor snowmelt and storm events.
14. The priority of catch basin inspection and cleaning should be increased to the same level of importance as street sweeping, especially in the Chester Creek basin.
15. The proposal to establish a recreational corridor and bikeway/pedestrian path along Ship Creek (recently described in the Municipality's Ship Creek Recreational Resources Plan) should be implemented.
16. Although not under the Municipality's jurisdiction, the Fort Richardson subdivision I retention/settling basin including an oil and grease separator, is recommended for serious consideration.
17. A structural measure that should be considered in the 208 Continuing Planning Program is the construction of parallel storm sewers, one on each side of Ship Creek. Each interceptor would be roughly 2½ miles long, and receive flow along its length from smaller connecting storm sewers and inlets. The outfalls would be near the mouth of Ship Creek. The size of the interceptors would be relatively small, due to the relatively small drainage area. This control measure will be reevaluated for feasibility after the water quality monitoring results become available.
18. For Lake Hood and Lake Spenard, it is recommended that the Municipality encourage the State Department of Transportation (who has jurisdiction over these water bodies) to define the suitable protected uses, conduct a water quality monitoring program, and enforce the use(s) and quality standards stipulated. Until this recommendation is executed, the Municipality is advised to restrict contact recreation activities in either lake.
19. A chapter on erosion and sediment control at construction sites is recommended for addition to the existing Department of Public Work's Design Criteria and Improvement Standards. This chapter is included in Appendix B of the 208 Water Quality Management Plan.
20. No structural controls can be recommended for any existing snow disposal sites in the absence of docu-

mented water quality problems attributable to runoff or percolation from the sites. A Management subplan is recommended to assess the existing sites and establish a formal site selection process for future sites. A site evaluation and screening system is presented in Appendix C of the 208 Plan.

21. The existing program of regulating onsite disposal of domestic wastewater is considered to be a strong one. But to formalize the existing review process, correct problems with older, failing systems, and to provide better maintenance, the 208 Plan recommends 13 supplementary controls to be exercised in areas where sanitary sewers are not planned for the future.

Expected 208 Program Results

Thus far this summary has discussed water quality goals, existing water quality problem areas, alternative control strategies and tasks, plan evaluation and the recommended control strategy. But what of the expected results of the 208 Program? How much control of pollutants can be expected if the Level 2 control strategy is implemented? Following is a discussion of each water quality problem area, and the expected results of the 208 controls.

Fecal Coliform. Measurement of fecal coliform bacteria indicates the possible presence of pathogenic organisms. The Level 2 objective for fecal coliform control is to eliminate those organisms that are associated with discharges of improperly treated human waste. The measurement of fecal coliform levels will be continued. If high instream levels are detected, further investigation will define sources, assess their significance, and eliminate the source as necessary.

Un-ionized Ammonia Nitrogen. Presently this pollutant is not a problem, although future increases in water temperature and pH will increase ammonia toxicity. Level 2 controls will decrease future loadings of ammonia from urban runoff by 60% and insure maintenance of stream bank vegetation.

Heavy Metals. The Level 2 control strategy for heavy metals is to maintain existing in stream concentrations by controlling future peat bog drainage, and by reducing levels in urban runoff by 50 to 60 percent in developing basins. No increase in heavy metal content will be allowed in runoff from developed basins.

Oil and Grease. The control of oil and grease will limit additional loadings by reducing urban runoff pollution by

60% in developing basins. No increase will be allowed in developed areas.

Sediment and Suspended Solids. Maintenance of existing instream conditions in Campbell Creek will require a 60 percent reduction of total 1995 sediment and suspended solids loadings from urban runoff. Erosion and sediment loadings from construction sites will be controlled using the best practical methods. Erosion control plans assuming no more than 15 tons per acre per year escapement of sediments will be required prior to the receipt of building permits.

Public Participation

Throughout the 208 study and plan development, public input and participation was actively sought, especially at critical times in the planning process, such as during the formulation and review of plan alternatives.

Anchorage's public participation process used public meetings/hearings, the normal government review process, a special 208 Policy Advisory Committee, and Community newsletters to both disseminate and receive information on the needs and interests of the community regarding the way in which the 208 Plan should be developed. The media, both written and electronic, were used to supplement these other review/participation mechanisms. The committees as well as the local government review process were essential to the definition of water quality problems, formulation of alternatives, and selection of the preferred plan that is now described in the Water Quality Management Plan. The public meetings, held jointly with the Corps of Engineers public meetings, as well as the specialized meetings with Community Councils and the Planning and Zoning Commission, were influential in gaining insight into the general preference of the community as to the level of water quality to be achieved and the acceptability of the control measures to be applied in attaining this level. Both sets of processes were complementary and attempted to provide the necessary direction of the technical staff in both plan formulation and development.

Each of the three major components of public participation--the use of committees, public meetings, and the local government review process--raised a variety of concerns regarding both technical and policy issues in the draft 208 plan. Some of the more significant concerns included the following:

- The levels of water quality that should be achieved.
- The types of mix of control measures to be used.
- The costs and socioeconomic impacts of the various control measures.

- The existing levels of water quality in area streams.
- The ability of the Municipality to implement certain control measures.
- The nature and effectiveness of the continuing water quality management process.
- The effect of the water quality management program on the cost and patterns of urban development.
- The integration of the water quality management plan and other forms of areawide sewage, land use, and water supply planning.

Each of these issues were addressed by staff in their preparation of the draft Plan. As appropriate, these issues were evaluated in terms of cost, feasibility, and effectiveness. Based upon these evaluations, the initial recommendations contained in the Plan or separate technical memoranda were either (1) deleted, (2) modified to reflect the recommended change, or (3) added to reflect the concerns expressed by the public. These staff evaluations were, in turn, reviewed by the various advisory committees and through the local government review process during the formulation and evaluation of plan alternatives. The latter groups provided the final indication as to whether the changes recommended by the public were to be incorporated into the Plan.

Institutional Responsibilities and Plan Implementation

Now that the 208 Plan is developed and approved, the most important part of the 208 program will be the implementation of the Plan. Without a clear, rational program for implementation even the best plan will be ineffective.

The 208 Plan has been built around existing ordinances and programs, all of which are now administered by the Municipality of Anchorage. In most cases, it formalizes and somewhat improves practices now in effect. No significant management or institutional modifications are required. Departments and agencies that are currently responsible will continue to manage the same (albeit slightly amended in some cases) programs in the future.

Table 3 shows which Municipal departments have responsibility for different parts of the program. A discussion of these responsibilities follows:

Department of Public Works

The Department of Public Works will be the major actor in the implementation of 208 controls. Regarding urban runoff, the Department will have prime responsibility for enforcing

Table 3
Institutional Responsibilities

Program	Agency	
	Primary Responsibility	Secondary Responsibility
<u>URBAN RUNOFF</u>		
1. Storm Water Detention	Public Works	Health and Environmental Protection
2. Stream Corridor Protection		
a. Restrict stockpiling of hazardous material in flood plain ✓	Planning	Corps of Engineers
b. Regulate inwater work ✓	Public Works	Health and Environmental Protection
c. Linear park planning	Parks and Recreation	Planning
3. Streetsweeping	Public Works	State of Alaska
4. Control of Untreated Waste Discharges ^{planning} ✓	Health and Environmental Protection	State of Alaska
5. Pave Roads/Parking Lots	Public Works	State of Alaska
6. Land Use Control		
a. Development of peat bogs ✓	Public Works	Planning
b. Bonus point system ✓	Planning	
c. Environmental design	Planning	
7. Discharge/Diversion (Local Drainage) ✓	Public Works	Corps of Engineers
8. Water Quality Monitoring	Health and Environmental Protection	U.S. Geologic Survey
<u>SOIL EROSION AND SEDIMENT CONTROL</u>		
1. Administration	Public Works	Health and Environmental Protection
2. Develop Criteria ✓	Public Works ✓	Health and Environmental Protection
<u>SNOW DISPOSAL</u>		
1. Operate Existing Sites	Public Works	
2. Site Selection ✓	Public Works ^{joint w/ planning}	Planning, Health and Environmental Protection
3. Water Quality Monitoring	Health and Environmental Protection	U.S. Geologic Survey
<u>ONSITE WASTEWATER DISPOSAL</u>		
1. Comprehensive Survey ✓ ^{3 hrs}	Health and Environmental Protection	
2. Computerize Data ✓	Health and Environmental Protection	
3. Increased Inspection	Health and Environmental Protection	
4. Voluntary Maintenance	Health and Environmental Protection	
5. Continued Inspection	Health and Environmental Protection	
6. Dual Absorption Systems ✓	Health and Environmental Protection	
7. Certification of Soils Technicians ✓	Health and Environmental Protection	
8. Approval of Title Transfers	Health and Environmental Protection	
9. Water Conservation	Health and Environmental Protection	
10. Formulation of Procedures ^{planning} ✓	Health and Environmental Protection	
11. Public Education	Health and Environmental Protection	

storm water detention requirements, regulating instream construction activities, and reviewing plats for stream corridor protection, enforcing ordinances which affect streetsweeping, and managing all facets of street maintenance. In the latter, Public Works will be assisted by the State of Alaska. (The State is obviously responsible for cleaning and maintaining State-owned roadways.) Public Works will also regulate development of peat bog areas. It will review specifications and drawings and provide consultation to the developer on measures to mitigate potential water quality impacts, i.e., staging discharges during high flow, etc.

Public Works will also have the primary responsibility for administering and enforcing, through inspection, the proposed soil erosion and sediment control requirements. Lastly, it will continue to play the major role in existing snow disposal operations and will be the lead agency for selection of future snow disposal sites.

Department of Planning

A major responsibility of the Department of Planning will be administration and enforcement of land use controls. This will include the enforcing measures which alleviate land use impact on stream corridor areas and protect environmentally sensitive areas. This Department will also administer the "bonus point" system and the requirements for environmental design. Inasmuch as these elements are directed toward water quality and the reduction of runoff, coordination with the Department of Public Works is implied. The Planning Department will play a support role in assisting the Department of Public Works in identification of suitable future snow disposal sites. The Department of Planning will also be responsible for continued planning and management efforts associated with the 208 program. This will involve assurance that the plan is constantly updated to respond to local developmental changes, to provide coordination between land use planning and water quality management and to coordinate the 208 plan with other planning activities. Coordination of 208 and Coastal Zone Management planning is an obvious example.

Department of Health and Environmental Protection

This Department will be responsible for issuing permits for onsite wastewater disposal systems, controlling the location of such systems, setting design criteria, inspection during installation to ensure conformance with criteria, and assuring that failed systems are repaired. The Department will also continue to provide information on the operation and management of all forms of individual treatment.

This agency will work closely with the U.S.G.S. in all water quality monitoring efforts and will be responsible for compilation of data and its dissemination to other departments and agencies for planning and enforcement purposes.

Plan Implementation

A schedule for plan implementation has been prepared and is shown on Table 4. The table shows the specific control tasks and the approximate dates by which they will be put into practice.

Steps have already been taken to develop a continuing 208 Program to insure plan implementation. A work plan has been written outlining a three year extension of the 208 program. The major elements in this continuation program are the management and implementation of 208 Plan recommendations, the integration of storm water drainage planning with urban runoff water quality planning, and special studies of the Hillside area and for wetlands preservation. Funding for this program will be provided by the Municipality of Anchorage, the Environmental Protection Agency and the State of Alaska. This combination of a specific implementation schedule in the 208 Plan and funding for a continuation of the 208 Program will do much to guarantee plan implementation and meet the water quality goals for the Anchorage creeks and lakes.

Table 4
Implementation Schedule

	1979	1980	1981	1982	1983
<u>PETITION FOR STREAM RECLASSIFICATION</u>	████████				
<u>URBAN RUNOFF</u>					
o <u>Amend Subdivision Regulations To:</u>					
✓ 1. Require Storm Water Detention (Revised Criteria)		████████			
2. Require Environmental Design to Minimize Runoff		████████			
✓ 3. Extend "Bonus Point" System to Suburbs		████████			
4. Require Paving of New Parking Lots			████████		
✓ 5. Mitigation Measures for Peat Bog Development			████████		
6. Minimize Use of Storm Sewers (Encourage Swales, Ditches)		████████			
o <u>Amend Flood Plain Regulations To:</u>					
1. Prohibit Storage of Toxics Within 100 Feet of Surface Waters		████████			
2. Limit Inwater Work to the Period From 1 June to 15 July		████████			
3. Require Bridge Crossings Rather Than Culverts		████████			
o <u>Amend Wastewater Disposal Regulations To:</u>					
1. Prohibit Municipal/Industrial Point Sources, and Direct Storm Sewer Discharges to Fresh Water			████████		
2. Prohibit Washing Down of Trucks and Equipment Such That Direct Runoff to Fresh Water Is Inevitable			████████		
o <u>Expand Water Quality Monitoring</u>					
1. Campbell Creek			████████		
2. Chester Creek				████████	
3. Ship Creek					████████
4. Fish Creek			████████		
o <u>Streetsweeping</u>					
1. Better Enforce Parking Ordinance and Litter Ordinance			████████		
2. Review Need to Increase Sweeping Frequency				████████	

Table 4. (Continued)

	1979	1980	1981	1982	1983	1984
o <u>Increase Catch Basin Maintenance</u>		█				
o <u>Review Need For Interceptor Storm Sewers on Campbell and Ship Creeks</u>						█
<u>SOIL AND EROSION CONTROL</u>						
o <u>Amend Subdivision Regulations To:</u>						
✓ 1. <u>Require Erosion Control Plans Under New Criteria</u>		█				
✓ 2. <u>Review Adequacy of Criteria</u>						█
<u>SNOW DISPOSAL</u>						
o <u>Adopt Site Selection Criteria</u>		█				
o <u>Initiate Water Quality Monitoring at Snow Disposal Sites</u>		█				
o <u>Review Criteria</u>						█
o <u>Review Need For Structural Controls</u>						█
<u>ONSITE WASTEWATER DISPOSAL SYSTEMS</u>						
o <u>Amend Wastewater Disposal Regulations To:</u>						
1. <u>Require Dual Adsorption System On All New Units, as Appropriate</u>		█				
2. <u>Require Certification of Soils Technicians</u>		█				
o <u>Comprehensive Sanitary Survey</u>		█				
o <u>Computerize Data</u>			█			
o <u>Institute Voluntary Maintenance Program</u>				█		
o <u>Formalization of DHEP Policy</u>		█				
o <u>Public Education</u>		█				
o <u>Review Adequacy of Control Program</u>						█
<u>OVERALL REVIEW OF 208 PROGRAM</u>						█

